

April 25, 2007

MEMORANDUM

TO: Oregon Watershed Enhancement Board

FROM: Greg Sieglitz, Monitoring and Reporting Manager

**SUBJECT: Agenda Item F: At-Sea Research: Oregon State University and Oregon Salmon Commission
May 15-16, 2007 OWEB Board Meeting**

I. Introduction

This report provides an update on OWEB's response to the 2006 Salmon Season State of Emergency and the continuation of activities by the Collaborative Research on Oregon Ocean Salmon (CROOS), Oregon Salmon Commission, and commercial fishermen during the 2007 ocean salmon fishing season.

II. Background

A major objective in salmon fishery management is ensuring access to healthy populations while also protecting weak stocks. Given limited understanding of the behavior and migration patterns of individual salmon stocks, it is difficult to manage stocks as distinct units. Ocean salmon managers are often compelled to institute large time/area closures to protect the weakest stocks. In 2006, this problem became acute when managers were forced to close most of the Oregon and California ocean troll salmon fishery to protect weak runs of Klamath River Chinook salmon. The result was the loss of many jobs and millions of dollars in coastal income and a declaration of a "salmon emergency" by the Governors of California and Oregon.

In response to the emergency declaration, the OWEB Board took the following action at the May 2006 meeting:

- Approved the allocation of \$40,000 of non-capital funds to purchase equipment for salmon-related ocean research.
- Directed staff to request expenditure limitation from the Emergency Board for no more than \$3,000,000 in Measure 66 Lottery Funds for a non-competitive grant program.
- Delegated, to the Executive Director, the authority to enter into appropriate grant and interagency agreements to distribute funds for the non-competitive grant program.

In June 2006, the Legislative Emergency Board allocated \$2.2 million in Measure 66 Lottery Funds to allow OWEB to carry out these efforts. The approved allocation was apportioned as follows:

Ocean Research	\$586,391
Restoration Implementation	\$700,000
Inventory and Assessment	\$250,000
Development of Restoration Projects	\$500,000
Recovery Plan Outreach	\$175,000

The distribution of the funds by the Executive Director is depicted in Attachment A.

Staff presented updates about the 2006 Salmon Season State of Emergency response, including Project CROOS and individual grant awards, at the September 2006 and January 2007 Board meetings.

III. Results of Project CROOS and Oregon Salmon Commission in 2006

The following section highlights the results from the OWEB-funded ocean research pilot project. Additional results can be found in Attachment B.

A. Financial Assistance

The project provided financial assistance to 40 percent of the active Oregon fleet. More than 72 vessels participated in at least one opener (72 operators, 54 crew). Over 4,270 fish were sampled which represented 16 percent of the Oregon commercial salmon harvest in 2006. A total of \$327,900 was distributed to operators and crew.

B. Genetic Stock Identification (GSI)

Over 4,200 tissue samples were delivered to the Coastal Oregon Marine Experiment Station (COMES) genetics laboratory along with associated digital or manual data. A total of 3,097 samples were processed and 2,567 fish were used to estimate stock mixture proportions. Probability values of stock assignment for these fish ranged from 28 to 100 percent. A total of 2,097 fish were assigned probabilities greater than or equal to 90 percent to a specific hatchery or reporting region.

C. Stock Mixture Proportions

The majority of sampled fish originated from California's Central Valley (59.08 percent). The Rogue River contributed the second greatest proportion (7.61 percent), followed by the Mid Oregon Coast (7.11 percent), and the Klamath Basin (6.58 percent). The California Coast and Northern California/Southern Oregon Coast regions contributed 2.17 percent and 1.89 percent, respectively. The Upper Columbia River summer/fall run was estimated to contribute 3.03 percent of the total. Twenty other stocks contributed less than two percent each.

D. Near "Real Time" Analysis

Near "real-time" genetic analysis was difficult to achieve during the initial few months of the project due to logistical issues and inadequate investment in laboratory resources. However, by September and October of 2006 fish were successfully assigned to individual genetic stock estimates in near "real-time" and all accompanying data was entered into the database within 24 to 48 hours of the laboratory receiving the sample.

E. Geographic Information Systems (GIS) Maps

GIS-based maps were developed that include troll tracks, precise time/location data on harvested fish, and menus for exploring relational data.

F. Website Development

A working "prototype" website was developed capable of reporting information to multiple audiences using a variety of tools, maps and statistical analysis. The entire working website will be accessible by mid to late May 2007 at www.ProjectCROOS.com.

IV. Plans for Project CROOS during the 2007 Ocean Salmon Season

Numerous persons and entities have expressed significant interest in the findings and exploratory research funded during the 2006 ocean salmon season. In March of 2007, local interests from the coastal communities, legislators, NOAA Fisheries, and the Governor's Office contacted OWEB with inquiries into the availability of funds for supporting Project CROOS for the upcoming ocean salmon fishing seasons. A request of \$600,000 was presented to OWEB in mid-April. At the time of this report, OWEB and the requestors are finalizing an agreement to use the remaining funds from the OWEB Salmon Emergency allocation to allow a second season of research to move forward. Project CROOS and the Oregon Salmon Commission have indicated their intent to request an additional \$200,000 in non-capital funds at the September 2007 Board meeting if funding is available.

A. Work Plan (Attachment C)

The funds proposed will be used to continue the 2006 work, which includes six major components: 1) conducting genetic stock identification (GSI) in spatially and temporally defined sampling grids along the entire Oregon Coast to determine behavior, location, and migration patterns of salmon stocks; 2) developing data loggers for use on small fishing vessels; 3) developing bar coding, traceability, and marketing technologies to manage and integrate salmon information; 4) designing a multiuse "real" time website to communicate information with multiple audiences; 5) collecting and analyzing otoliths (the inner ear bone that measures age like the rinds of a tree) and oceanographic information to understand salmon stock behavior and linkages with marine and freshwater ecosystems; and, 6) conducting salmon management analysis to improve salmon utilization and conservation.

B. Budget (Attachment D)

The proposed 2007 budget functions as a bridge between 2006 and 2008 when federal dollars are expected to fund a three-year West Coast GSI CROOS-related project. The requested funding for 2007 will allow CROOS, in cooperation with the National Marine Fisheries Service (NMFS) and the California salmon troll industry to 1) conduct scientific sampling protocols in the relatively open fisheries of 2007; 2) support collaborative salmon research infrastructure; and 3) help fishermen continue to financially recover from 2006.

The proposed CROOS project budget from May 1, 2007 – June 30, 2008 totals \$971,826. Of this amount, \$593,972 was requested from OWEB in April 2007, for expenditure from May 1 to September 21, 2007 (\$393,972), and \$200,000 for expenditure from September 21, 2007, to June 30, 2008. Project CROOS requested an additional \$218,254 from NMFS, and as of April 19, 2007, has only been able to secure \$100,000 of that amount. Match for the project totals \$159,599 (\$116,713 is the proportionate match for OWEB funds).

V. Recommendation

This is an information item only and no Board action is requested at this time.

Attachments

- A. Summary of Salmon Emergency Grants
- B. 2006 Executive Summary
- C. CROOS 2007 Work Plan
- D. CROOS 2007 Budget

Attachment A

FISHER EMERGENCY PROJECTS

Project Number	Project Type	Grantee	Project Name	Award Date	Fund Amount
Non-Capital					
206-1005	Assessment	South Coast & Lower Rogue WSCs	South Coast Fishers of Data	8/1/2006	22,669.00
206-1006	Assessment	Coos Watershed Association	Coos Estuary Heads of Tide Streams Coho Salmon Spawning Surveys	8/7/2006	49,946.00
206-1008	Assessment	Coos Watershed Association	Coho Salmon Life Cycle Monitoring in Palouse and Larson Creeks	8/22/2006	44,064.00
206-1013	Assessment	MidCoast WSC	Workforce Beaver Pond Inventory	9/5/2006	50,000.00
206-1014	Assessment	Douglas SWCD	Lower Umpqua Basin Fish Barrier Inventory and Prioritization	9/5/2006	32,660.00
206-1017	Assessment	MidCoast WSC	Adult Salmon Trapping	12/11/2006	50,000.00
206-1021	Assessment	Coos Watershed Association	Coos Bay Estuary Fish Seining Project Meta-analysis	2/21/2007	49,993.00
206-1007	Technical Assis	Coos Watershed Association	Coos Lowland and Heads-of-Tide Riparian Project Development	8/15/2006	39,882.00
206-1023	Restoration	Salmon Drift Cr WSC	Lower Salmon-Siletz Riparian Restoration	2/8/2007	3,418.00
206-832	Research	Oregon Salmon Commission	At-Sea DNA research pilot project	5/17/2006	286,391.00
206-839	Education	OSU Research Accounting	OSU Recovery Planning Outreach-Fishing Disaster	8/17/2006	190,840.00
206-1025	Research	Oregon Salmon Commission	At-Sea DNA research pilot project-phase II 2007	5/1/2007	391,528.00
Grants Committed					1,211,391.00
Board Funds Available					1,211,391.00
Uncommitted Remaining Funds					0.00
Capital					
206-1016	Restoration	Coos Watershed Association	Coos Bay Riparian Planting, Maintenance and Bank Stability Fisher Crew Project	12/11/2006	230,777.00
206-1020	Restoration	Lincoln SWCD	Fishing for Trees - Resubmittal	1/19/2007	200,432.00
206-1023	Restoration	Salmon Drift Cr WSC	Lower Salmon-Siletz Riparian Restoration	2/8/2007	72,173.00
206-1000	Restoration	Coos Watershed Association	Coos Bay Riparian Enhancement Crew	7/18/2006	89,289.00
206-1001	Restoration	Coquille Watershed Association	Coquille WS Salmon Season Riparian Restoration	7/18/2006	195,450.00
206-1009	Restoration	South Coast & Lower Rogue WSCs	South Coast Fishers at Work	8/22/2006	127,331.00
206-1010	Restoration	Tillamook Estuaries Partnership	Tillamook Bay Riparian Enhancement	8/22/2006	141,296.00
206-1012	Restoration	Siuslaw WSC	Siuslaw Riparian Restoration and Release Support Crew	9/5/2006	116,529.00
Grants Committed					1,173,277.00
Board Funds Available					1,500,000.00
Uncommitted Remaining Funds					326,723.00
Research and Development					
206-832	Research	Oregon Salmon Commission	At-Sea DNA research pilot project	5/17/2006	300,000.00

PROJECT CROOS
Collaborative Research on Oregon Ocean Salmon

Using “Real Time” Genetic Information to Address the Klamath ‘Weak’ Stock Crisis for Oregon’s Ocean Salmon Fishery

EXECUTIVE SUMMARY

Background

A major objective in salmon fishery management is ensuring access to healthy populations while also protecting weak stocks. Given limited understanding of the behavior and migration patterns of individual salmon stocks, it is difficult to manage stocks as distinct units. Ocean salmon managers are often compelled to institute large time/area closures to protect the weakest stocks. In 2006 this problem became acute when managers were forced to close most of Oregon and California’s ocean troll salmon fishery to protect weak runs of Klamath River Chinook salmon. The result was the loss of 100’s of jobs and millions of dollars in coastal income and a declaration of a “salmon disaster” by the Governors of California and Oregon.

To address the challenge of inadequate science supporting management of multi-stock ocean salmon fisheries, the Oregon Salmon Commission, together with scientists from Oregon State University and federal and state agencies co-located at the Hatfield Marine Science Center, formed the CROOS group (*Collaborative Research on Oregon Ocean Salmon*). CROOS proposed a comprehensive pilot project to test the potential of using *genetic stock composition* (GSI) and the GAPS database (Genetic Analysis of Pacific Salmonids) to identify in “real time” spatial and temporal characteristics of individual salmon stocks. It was proposed that the availability of “real-time” data could potentially enable fisheries managers to 1)) differentiate stocks in “real time” at refined spatial areas, 2) improve salmon conservation while allowing harvest of healthy stocks, and 3) integrate science and management of freshwater, estuarine, and marine salmon ecosystems. In June 2006, the Oregon Watershed Enhancement Board (OWEB), as part of a state-wide effort to provide salmon disaster assistance, agreed to fund a CROOS pilot project to test the potential application of GSI techniques.

Objectives

The goal of CROOS was to conduct collaborative research and develop protocols using “real time” GSI to improve science, management, and marketing of West coast Chinook salmon. Specific objectives included 1) providing financial assistance to participating salmon fishermen 2) developing sampling protocols for fishermen and fleet coordinators/managers, 3) conducting near “real time” GSI analysis, 4) developing digital technologies and “traceability” systems, 5) designing a comprehensive web site, 6) developing methods for collecting oceanographic information, and 7) considering potential of GSI technologies for improving salmon management.

Findings and Results

Financial Assistance The project provided financial assistance to 40% of the active Oregon fleet. More than 72 vessels participated in at least one opener (72 operators, 54 crew). Over 4,270 fish were sampled which represented 16% of the Oregon commercial salmon harvest in 2006. A total of \$327,900 was distributed to operators and crew.

Protocols Project managers developed detailed protocols for biological sampling, data collection, fleet management, fishermen training, and project coordination.

Genetic Stock Identification (GSI) Over 4,200 tissue samples were delivered to the Coastal Oregon Marine Experiment Station (COMES) genetics laboratory along with associated digital or manual data. A total of 3,097 samples were processed and 2,567 fish were used to estimate stock mixture proportions. Probability values of stock assignment for these fish ranged from 28% - 100%. A total of 2,097 fish were assigned probabilities $\geq 90\%$ to a specific hatchery or reporting region.

Stock Mixture Proportions The majority of sampled fish originated from California's Central Valley (59.08%) The Rogue River contributed the second greatest proportion (7.61%), followed by the Mid Oregon Coast (7.11%) and the Klamath basin (6.58%). The California Coast and Northern California/Southern Oregon Coast regions contributed 2.17% and 1.89%, respectively. The Upper Columbia River summer/fall run was estimated to contribute 3.03% of the total. Twenty other stocks contributed less than 2% each.

100% Assignment of Coded Wire Tagged (CWT) Fish Thirty-one of the 2,097 fish that met the 90% probability criteria contained coded wire tags. All 31 CWT fish assigned to the correct hatchery of origin.

Near "Real Time" Analysis Near "real-time" genetic analysis was difficult to achieve during the initial few months of the project due to logistical issues and inadequate investment in laboratory resources. However, by September/October fish were successfully assigned to individual genetic stock estimates in near "real-time" and all accompanying data entered into the database (within 24 - 48 hours of laboratory receiving the sample).

Geographic Information Systems (GIS) Maps GIS-based maps were developed that include troll tracks, precise time/location data on harvested fish, and menus for exploring relational data.

Data Loggers Digital data-logging devices for fishing vessels were successfully tested and proved to be easier to use than "manual" sampling protocols.

Website Development A working "prototype" website was developed capable of reporting information to multiple audiences using a variety of tools, maps and statistical analysis. The entire working website will be accessible by mid-late May 2007 at www.ProjectCROOS.com.

Oceanographic Data Collection by Autonomous Vessels A successful pilot test was conducted which showed that autonomous underwater gliders could be used in conjunction with commercial fishing vessels for collecting a wide range of oceanographic data.

Recommendations and Next Steps

Improving Project Protocols Many protocols will need adjustment in response to changing fishing and sampling conditions. CROOS project members can work with other West coast states, industries, and agencies to design, implement, and refine protocols.

Improving the GAPS Database The GAPS database requires continual improvement. Further characterization of stocks within and adjacent to the Klamath basin are recommended.

Expanding GSI Data Collection Coast Wide Implementing GSI for salmon management will require expanded data collection along the West coast. Expanded data should be used to identify stock distribution patterns, test relevant hypotheses, and integrate oceanographic information.

Collecting and Integrating Oceanographic Information Oceanographic data will be critical for understanding salmon behavior and improving science and management. Future projects should combine vessel-based data collection with autonomous underwater gliders.

Improving the Design of Vessel Data Loggers Commercial digital dataloggers are inadequate given the needs for a tough, waterproof, relatively inexpensive, portable and reprogrammable logger. A national workshop should be conducted to examine digital-based data collection from commercial fishing vessels. Partnerships with private manufactures should be evaluated.

Designing a Multiuse “Real time” Website The prototype GIS-based website should be developed and tested to ensure security, privacy, reliability, and to accommodate multiple users.

Using Barcodes, Traceability, and the Website to Improve Salmon Marketing Test markets should be conducted that “link” individual harvest information from producers to consumers, enhance market development, and minimize fraud.

Developing and Testing GSI-based Salmon Management Models Management models should be developed that incorporate GSI information. Management simulations should be conducted with salmon managers in “real time” to evaluate in-season management approaches. Bioeconomic models should evaluate GSI information and industry incentives for improving management of the salmon fishery.

Proposal -- Project CROOS 2007

Using “Real Time” Genetic Information to Improve Science, Management, and Marketing of Oregon’s Ocean Salmon Fisheries

Proposal to: Oregon Watershed Enhancement Board
775 Summer Street NE, Ste 366
Salem OR 97301-1290

Submitted by: Oregon Salmon Commission
P.O. Box 983
Lincoln City, OR 97367

Coastal Oregon Marine Experiment Station (COMES)
Oregon State University
Hatfield Marine Science Center
2030 Marine Science Drive
Newport, OR 97365

Requested amount: \$ 593,972 (\$393, 972 May 1-Sept 21, 2007)
(\$200,000 Sept 21, 2007 – June 30, 2008)

Proposed duration: Fourteen months

Starting date: May 1, 2007

Principal Investigators:

Nancy Fitzpatrick, Administrator-Oregon Salmon Commission
Tel/Fax (541) 994-2647
Email: njf@class.oregonvos.net

Dr. Michael A. Banks,
Tel: (541) 867-0420
Fax: (541) 867-0345
Email: michael.banks@oregonstate.edu

Dr. Michael T. Morrissey
Tel. (503) 325-4531 x2
Fax (503) 325-2753
Email: michael.morrissey@oregonstate.edu

Dr. Gil Sylvia
Tel: (541) 867-0284
Fax: (541) 867-0345
Email: gil.sylvia@oregonstate.edu

Proposal -- Project CROOS 2007

Using “Real Time” Genetic Information to Improve Science, Management, and Marketing of Oregon’s Ocean Salmon Fisheries

Project Summary

Managers were required to close most of Oregon’s troll salmon fishery during 2006 in order to reduce harvests of Klamath River salmon. This resulted in the loss of 1000’s of jobs and millions of dollars in coastal income. Although Klamath stocks are rebounding in 2007, traditional salmon management tools are expected to continue to require large time/area closures to protect weak stocks. New tools are needed that can 1) differentiate stocks in “real time” at refined spatial areas, 2) improve salmon conservation while allowing harvest of healthy stocks, and 3) integrate science and management of freshwater, estuarine, and marine salmon ecosystems.

This project builds on the experience and leadership demonstrated by the Oregon salmon industry and its university and agency partners in the pilot project known as CROOS (*Collaborative Research on Oregon Ocean Salmon*). The CROOS project demonstrated that hatchery or basin of origin could be determined for salmon stocks in virtual “real time” using data obtained by commercial fishing vessels. The project heralded a new era for “real time” management of ocean fisheries based on interdisciplinary collaboration and cutting edge tools in genetic science and digital technologies.

The proposed project continues the work begun in 2006 and includes six major components: 1) conducting genetic stock identification (GSI) in spatially and temporally defined sampling grids along the entire Oregon Coast to determine behavior, location, and migration patterns of salmon stocks; 2) developing data loggers for use on small fishing vessels; 3) developing barcoding, traceability, and marketing technologies to manage and integrate salmon information; 4) designing a multiuse “real” time website to communicate information with multiple audiences; 5) collecting and analyzing otoliths and oceanographic information to understand salmon stock behavior and linkages with marine and freshwater ecosystems; and, 6) conducting salmon management analysis to improve salmon utilization and conservation.

Project Budget

This project builds on 2006 OWEB funded work. The proposed 2007 budget functions as a bridge between 2006 and 2008 when federal dollars are expected to fund a three year West Coast GSI CROOS related project. The requested funding in 2007 will allow CROOS, in cooperation with NMFS and the California salmon troll industry, to 1) conduct scientific sampling protocols in the relatively open fisheries of 2007, 2) support collaborative salmon research infrastructure, and 3) help fishermen continue to financially recover from 2006. The project budget from May 1, 2007 – June 30, 2008 totals \$971,826. Of this amount \$593,972 is requested from OWEB for expenditure from May 1-September 21, 2007 (\$393,972) and September 21, 2007-June 30, 2008 (\$200,000). National Marine Fisheries Service is expected to contribute between \$75,000-\$250,000 to the project, although the exact amount is yet unknown. Match for the project totals \$159,599 (\$116,713 proportionate match for OWEB funds).

